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(54) **Conference communications system**

(57) A conference communication system uses a card reader 34, accessible to each delegate, to read data on delegate identification cards held by each delegate. The identification data read by the card reader is transmitted to a remote location, for example the conference chairman's desk. The chairman is then able to select individual delegates to speak, the unit incorporating the card reader acting also as a speach transmitter and as a means for returning an authorisation signal to the delegate from the chairman. Signals are transmitted from the speech transmitter/card reader via an optical link and sent to a p.a. system 18, an interpretation unit 28 and a control unit 11 as well as to the chairman 12. Information is returned to other delegates by an optical link to individual headsets 32.

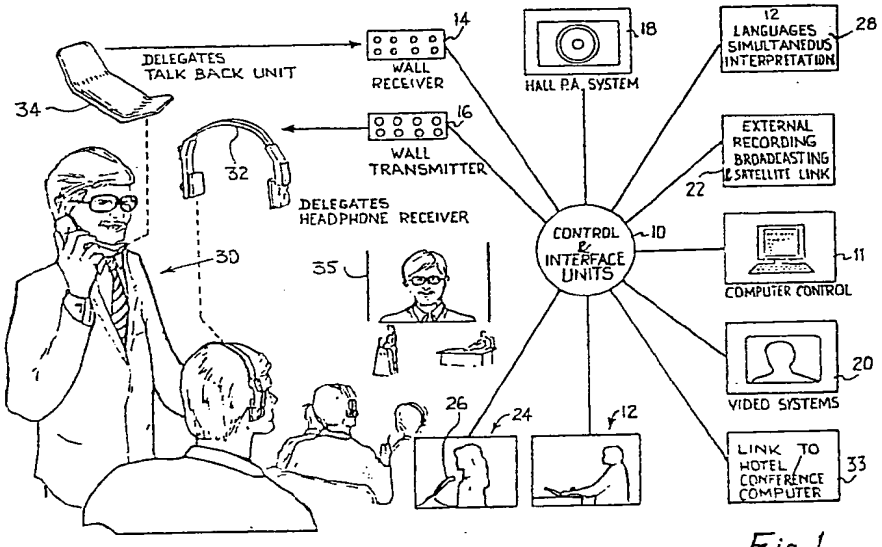

Fig.1

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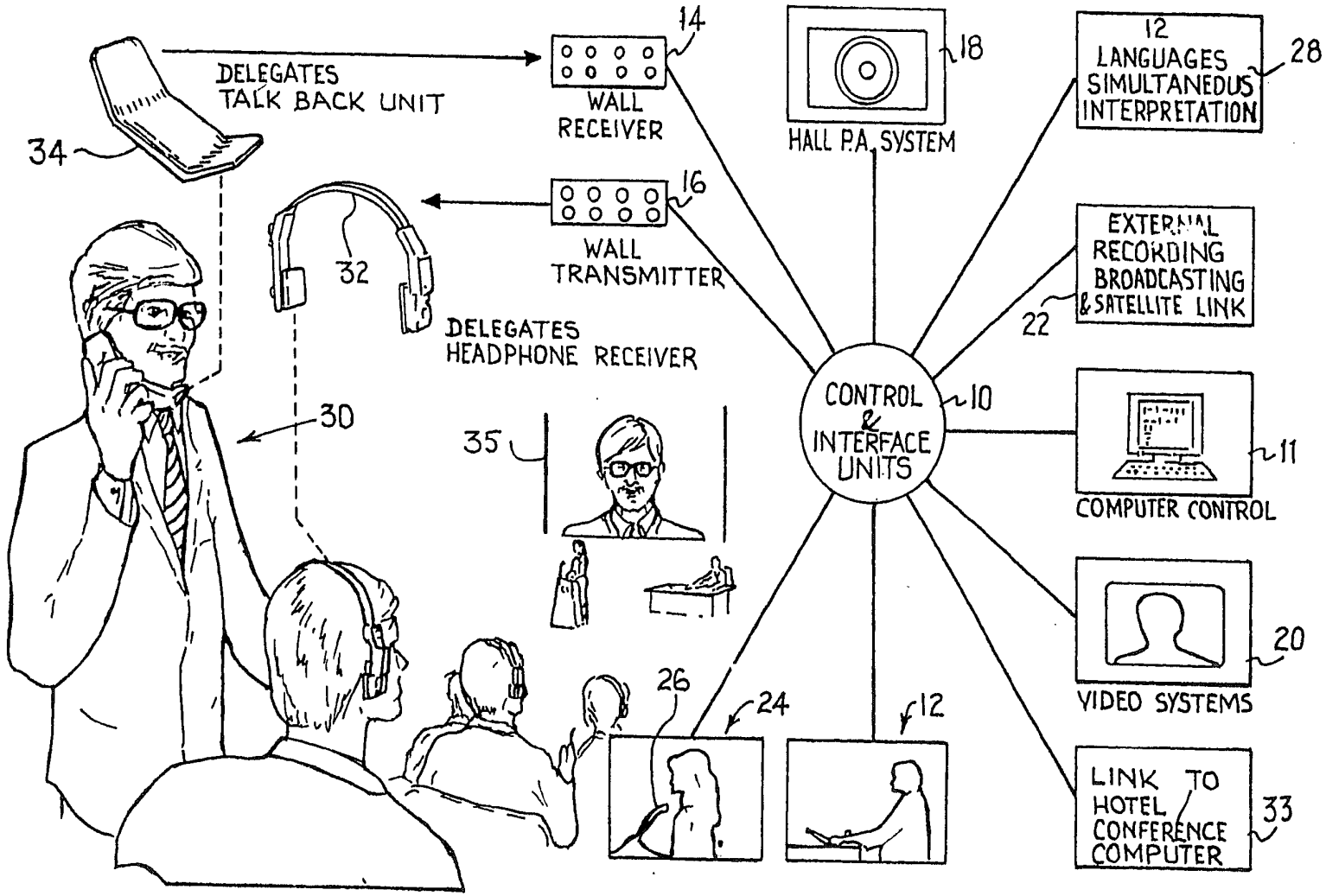

Fig. 1

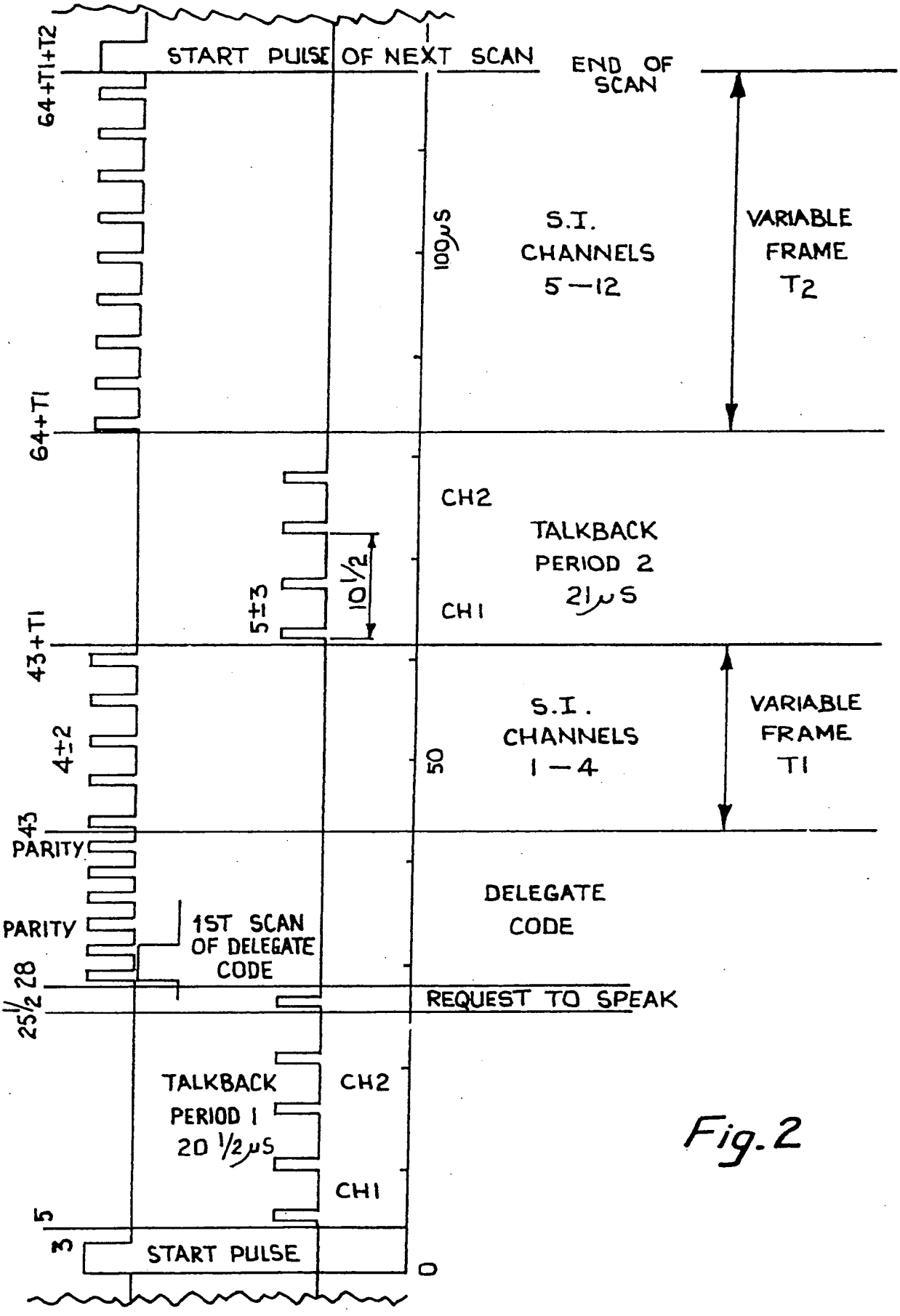
64+T1+T2
START PULSE OF NEXT SCAN
END OF SCAN
100μS
S.I. CHANNELS 5—12
VARIABLE FRAME T2
64+T1
CH2
TALKBACK PERIOD 2 21μS
CH1
5±3
10½
43+T1
4±2
50
S.I. CHANNELS 1—4
VARIABLE FRAME T1
43
PARITY
PARITY
1ST SCAN OF DELEGATE CODE
DELEGATE CODE
28
25½
REQUEST TO SPEAK
TALKBACK PERIOD 1 20½μS
CH2
CH1
5
3
START PULSE
0

Fig. 2

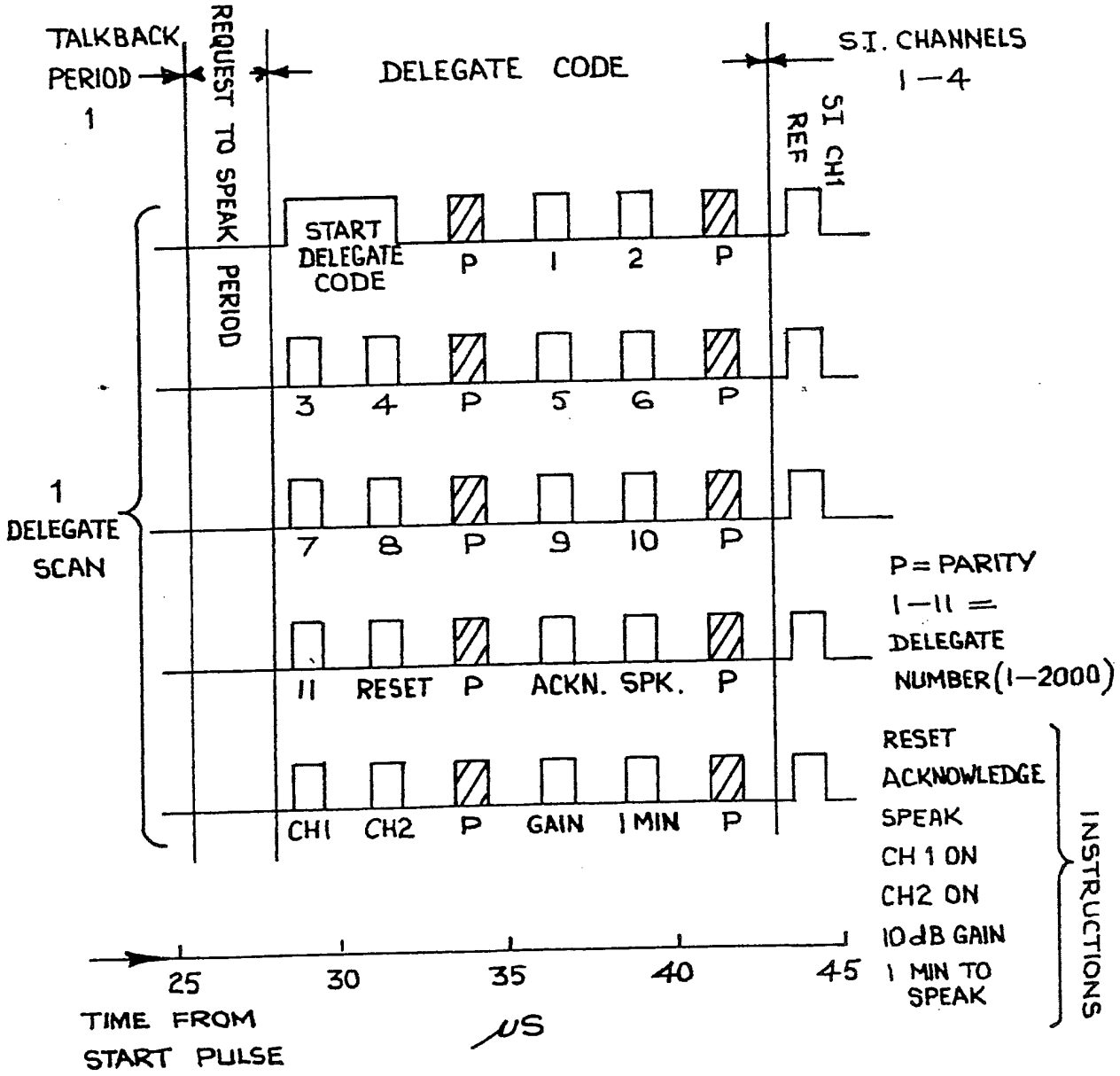
TALKBACK PERIOD 1
REQUEST TO SPEAK PERIOD
DELEGATE CODE
SI. CHANNELS 1—4
SI CH1 REF
START DELEGATE CODE
P 1 2 P
3 4 P 5 6 P
7 8 P 9 10 P
11 RESET P ACKN. SPK. P
CH1 CH2 P GAIN 1 MIN P
1 DELEGATE SCAN
P = PARITY
1—11 = DELEGATE NUMBER (1—2000)
RESET ACKNOWLEDGE
SPEAK
CH 1 ON
CH2 ON
10dB GAIN
1 MIN TO SPEAK
INSTRUCTIONS
25 30 35 40 45
TIME FROM START PULSE
μS

Fig. 3

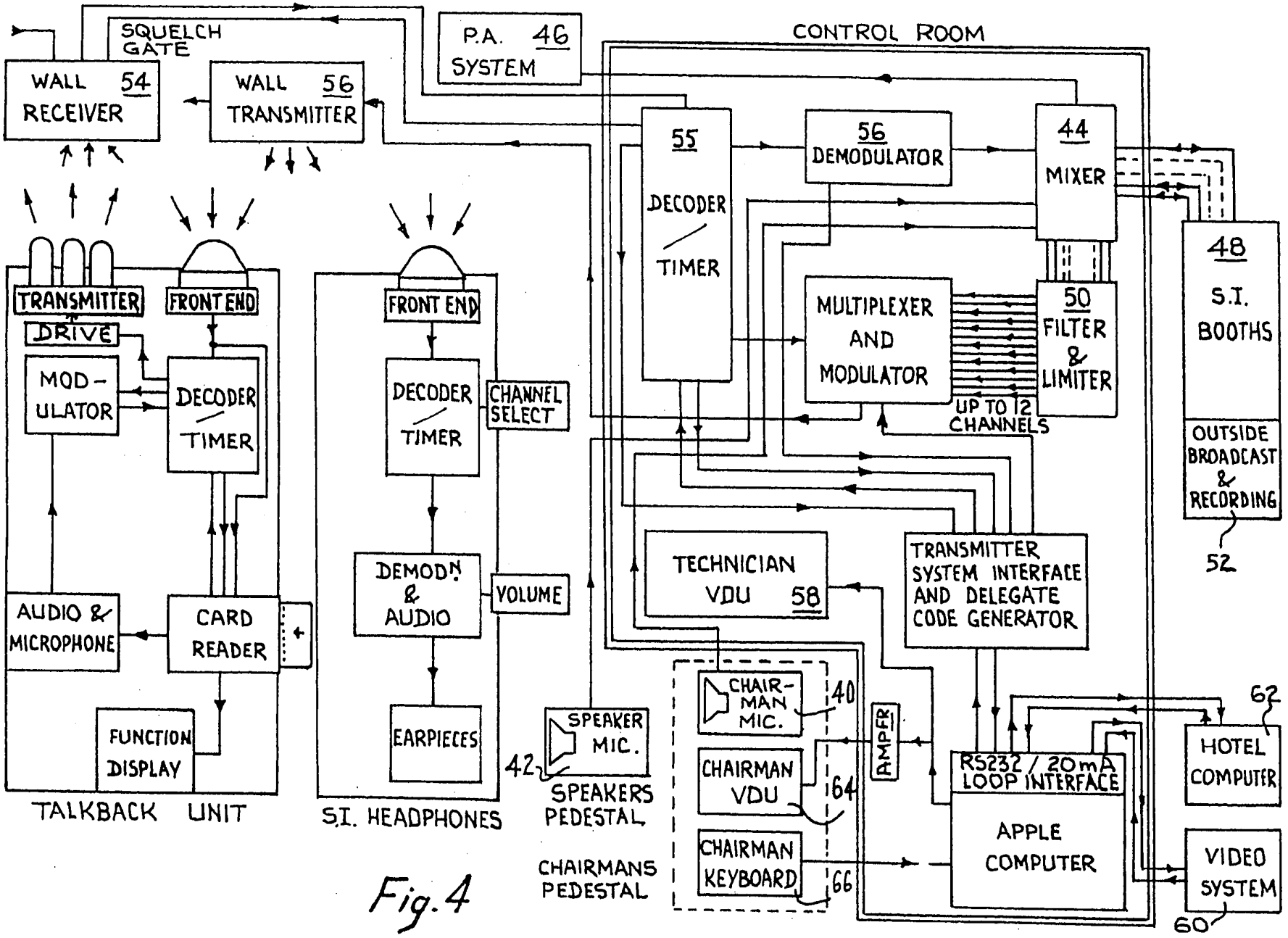

Fig. 4

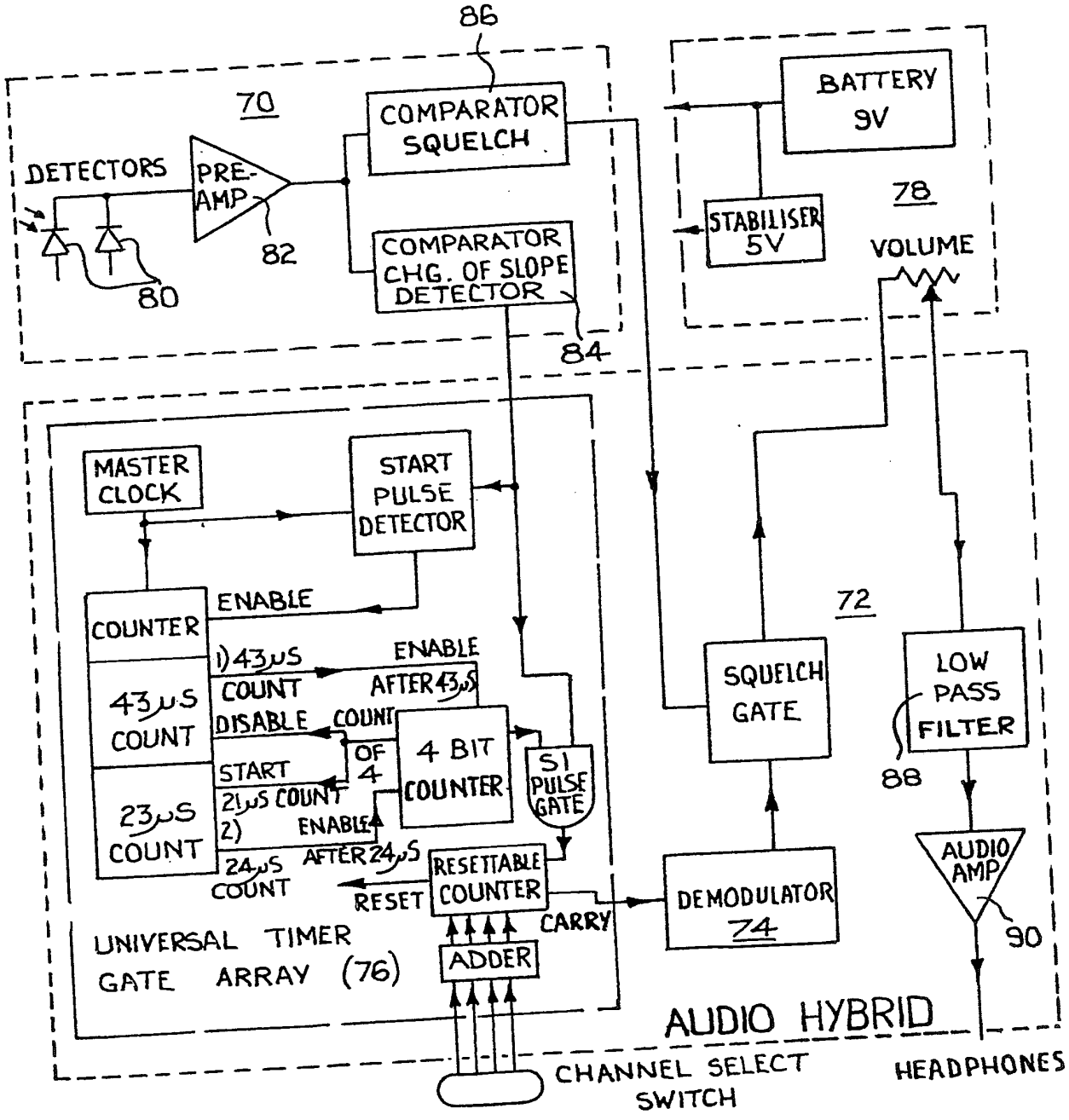
86
70
COMPARATOR SQUELCH
DETECTORS
PRE-AMP
82
80
COMPARATOR CHG. OF SLOPE DETECTOR
84
BATTERY 9V
78
STABILISER 5V
VOLUME
MASTER CLOCK
START PULSE DETECTOR
COUNTER
ENABLE
1) 43μS COUNT
ENABLE AFTER 43μS
43μS COUNT
DISABLE COUNT
START
OF 4
4 BIT COUNTER
S1 PULSE GATE
21μS COUNT
2)
ENABLE
23μS COUNT
24μS COUNT
AFTER 24μS
RESETTABLE COUNTER
RESET
CARRY
ADDER
UNIVERSAL TIMER GATE ARRAY (76)
72
SQUELCH GATE
LOW PASS FILTER
88
DEMODULATOR 74
AUDIO AMP
90
AUDIO HYBRID
CHANNEL SELECT SWITCH
HEADPHONES

Fig.5

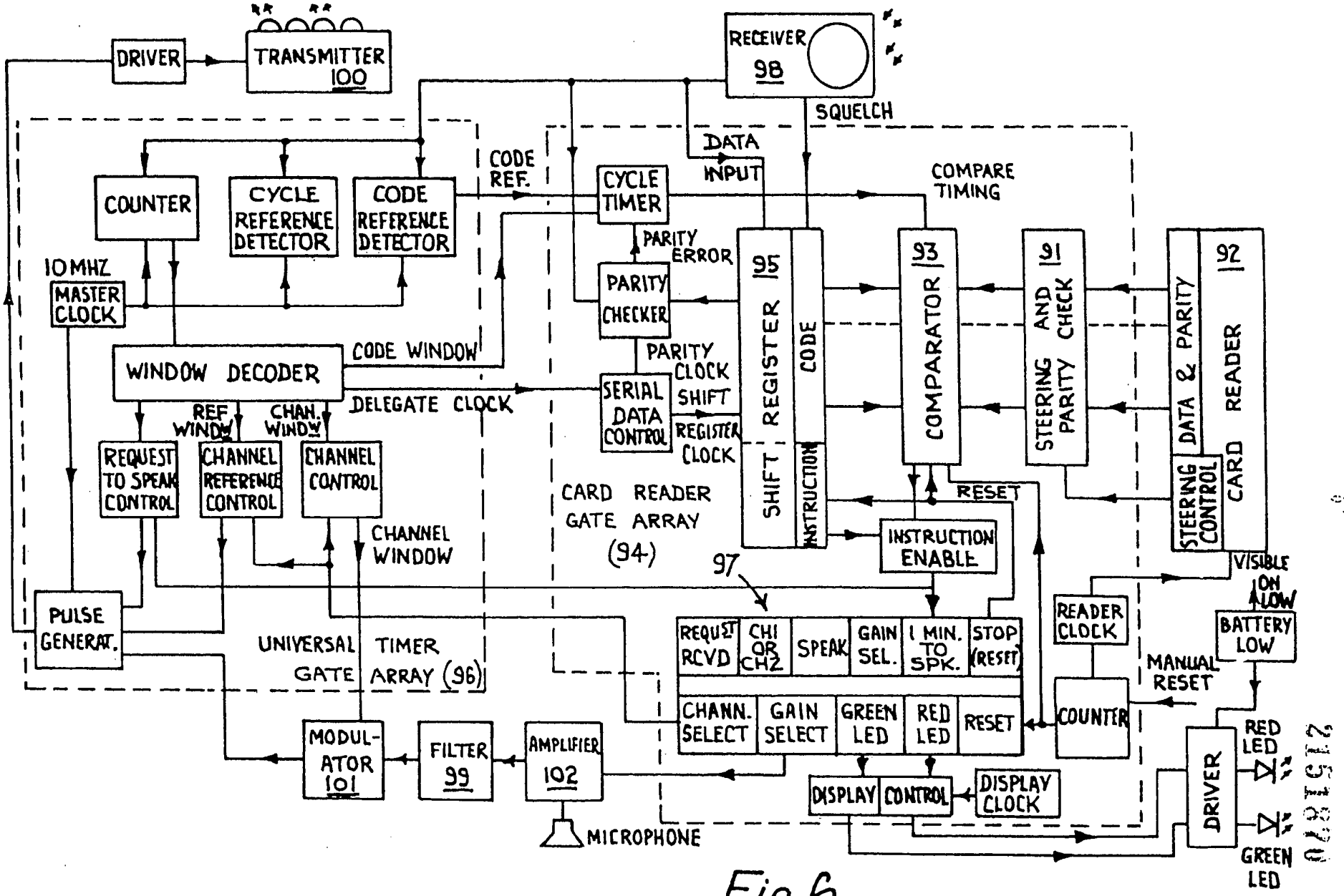
DRIVER
TRANSMITTER 100
RECEIVER 98
SQUELCH
DATA INPUT
COMPARE TIMING
COUNTER
CYCLE REFERENCE DETECTOR
CODE REFERENCE DETECTOR
CODE REF.
CYCLE TIMER
PARITY ERROR
10 MHZ
MASTER CLOCK
PARITY CHECKER
95
SHIFT REGISTER
CODE
INSTRUCTION
93
COMPARATOR
91
STEERING AND PARITY CHECK
92
DATA & PARITY
CARD READER
STEERING CONTROL
WINDOW DECODER
CODE WINDOW
DELEGATE CLOCK
PARITY CLOCK SHIFT
SERIAL DATA CONTROL
REGISTER CLOCK
REF WINDOW
CHAN. WINDOW
REQUEST TO SPEAK CONTROL
CHANNEL REFERENCE CONTROL
CHANNEL CONTROL
CHANNEL WINDOW
CARD READER GATE ARRAY (94)
RESET
INSTRUCTION ENABLE
97
VISIBLE ON LOW
READER CLOCK
BATTERY LOW
PULSE GENERAT.
UNIVERSAL GATE ARRAY (96)
TIMER
REQUEST RCVD
CHI OR CH2
SPEAK
GAIN SEL.
1 MIN. TO SPK.
STOP (RESET)
MANUAL RESET
CHANN. SELECT
GAIN SELECT
GREEN LED
RED LED
RESET
COUNTER
MODUL-ATOR 101
FILTER 99
AMPLIFIER 102
DISPLAY CONTROL
DISPLAY CLOCK
DRIVER
RED LED
GREEN LED
MICROPHONE

Fig.6

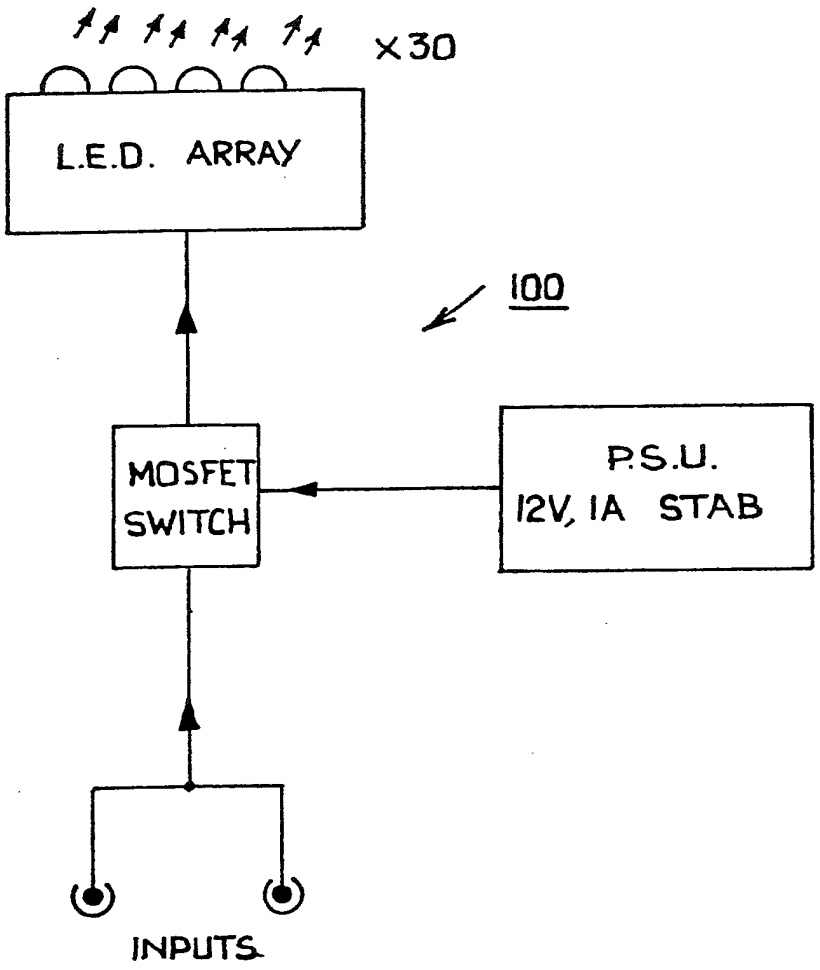

Fig.7

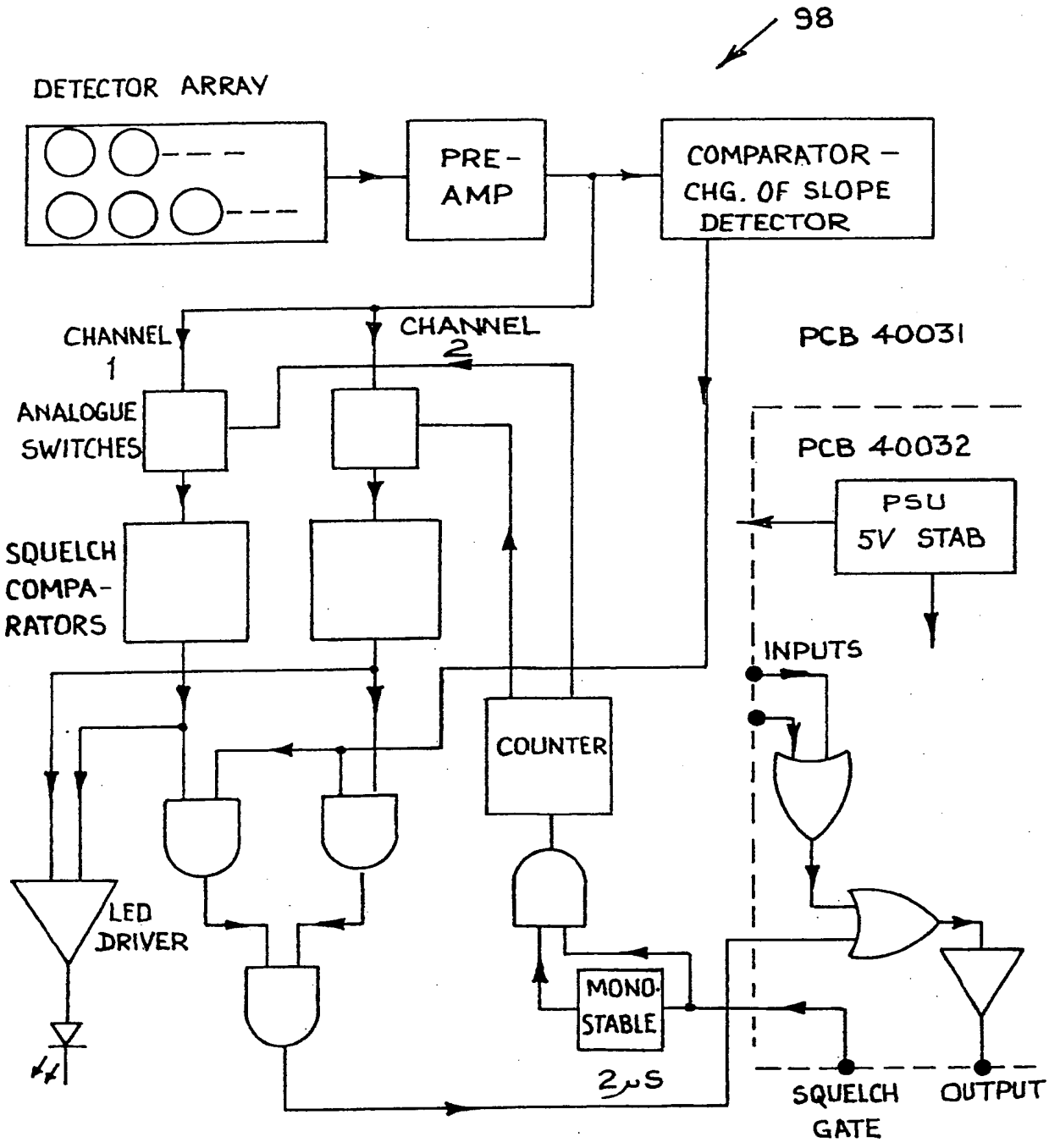
98
DETECTOR ARRAY
PRE-AMP
COMPARATOR - CHG. OF SLOPE DETECTOR
CHANNEL 1
CHANNEL 2
PCB 40031
ANALOGUE SWITCHES
PCB 40032
PSU 5V STAB
SQUELCH COMPA-RATORS
INPUTS
COUNTER
LED DRIVER
MONO-STABLE
2μS
SQUELCH GATE
OUTPUT

Fig.8

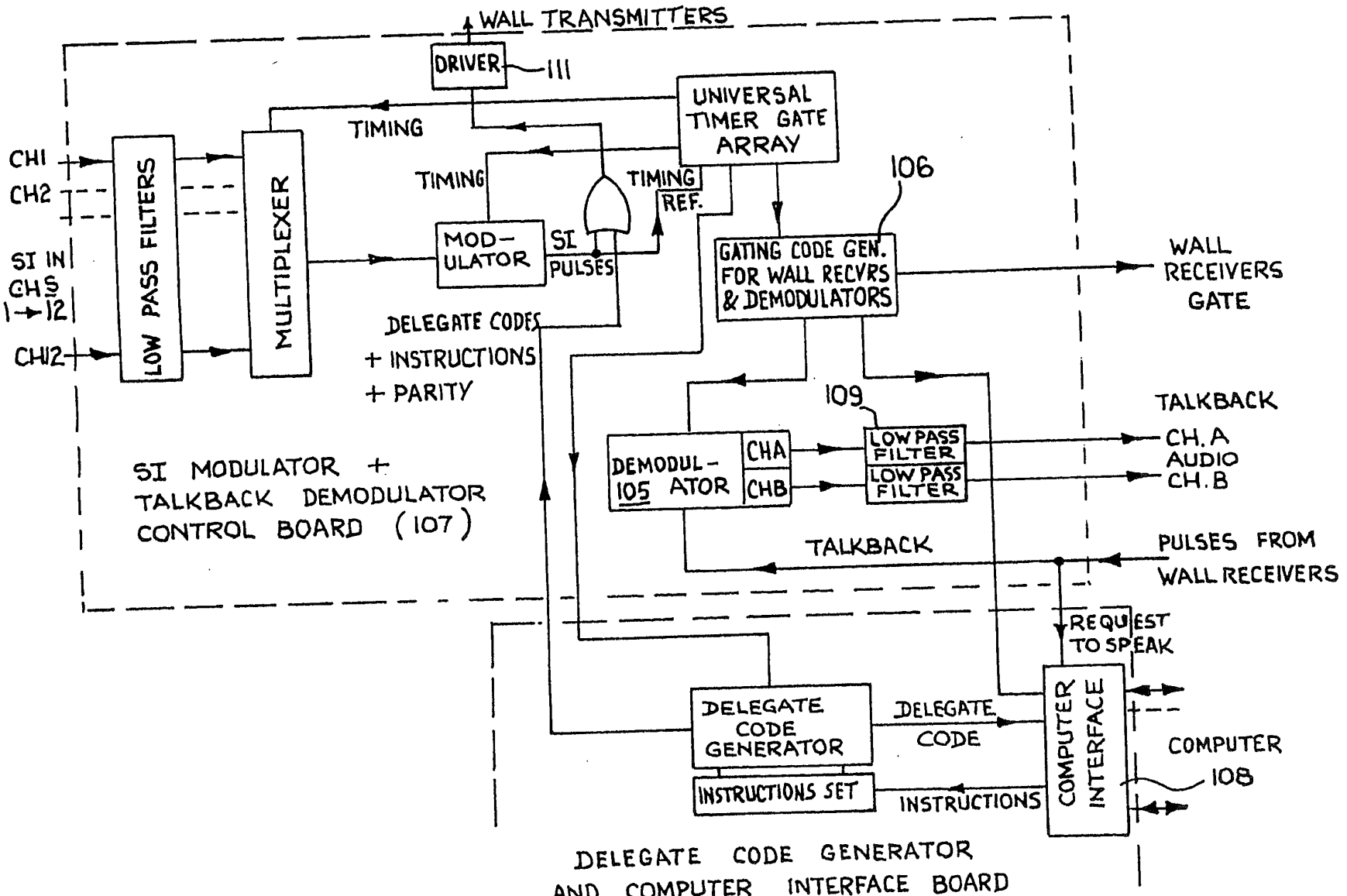
WALL TRANSMITTERS
DRIVER
111
UNIVERSAL TIMER GATE ARRAY
TIMING
TIMING
TIMING
REF.
106
CH1
CH2
SI IN CHS 1→12
CH12
LOW PASS FILTERS
MULTIPLEXER
MOD-ULATOR
SI PULSES
GATING CODE GEN. FOR WALL RECVRS & DEMODULATORS
WALL RECEIVERS GATE
DELEGATE CODES + INSTRUCTIONS + PARITY
109
TALKBACK
DEMODUL-105 ATOR
CHA
CHB
LOW PASS FILTER
LOW PASS FILTER
CH. A AUDIO CH. B
SI MODULATOR + TALKBACK DEMODULATOR CONTROL BOARD (107)
TALKBACK
PULSES FROM WALL RECEIVERS
REQUEST TO SPEAK
DELEGATE CODE GENERATOR
DELEGATE CODE
COMPUTER INTERFACE
COMPUTER 108
INSTRUCTIONS SET
INSTRUCTIONS
DELEGATE CODE GENERATOR AND COMPUTER INTERFACE BOARD

Fig.9

SPECIFICATION

Conference communications system

This invention relates generally to conference communication systems, and in particular to a system of the type which provides for communication between chairman, speaker and delegates under the supervision of a computerised controller.

Background to the invention

The term conferences as used herein means any type of meeting controlled by a chairman or the equivalent in which delegates or the equivalent attending the meeting who may themselves wish to speak, as by adding their own comments or asking questions, are addressed by one or more speakers. Nowadays, especially at organised conferences having pre-known delegates, communication between the chairman, delegates, speakers and other facilities such as language simultaneous translating booths, broadcasting links, is often controlled via a central computer. Through this central computer the delegates may wish to indicate a desire or intention to speak, when so authorised by the chairman. Assuming that such a speech has not been pre-arranged, the delegate has to bring this desire or intention to the chairman without interrupting the speaker, and the chairman will wish in due course to authorise the delegate to speak provided that he wishes to do so, introducing the delegate with identifying particulars. Generally, it will be preferred for the delegate to speak without having the delay and difficulty of moving to a speaker's microphone, and yet at the same time the other delegates will usually wish to be fully aware of the delegate's identity while he is speaking, without having to turn and look in a non-forward direction.

Object of the invention

It is an object of this invention to provide a solution to at least some of the communication problems which can arise at conferences, having regard to the above-mentioned requirements and preferences.

The invention

According to the present invention, there is provided, in a conference communications system of the stated type, a delegate-accessible card reader and, for each delegate, a delegate identification card to which can be applied delegate identification data, the card reader being capable of receiving the card and reading the data thereon for communication to the chairman via the controlling computer.

The identification card for each delegate will be prepared in advance from information supplied by the delegate prior to the conference, for example information supplied and fed into a hotel computer when a delegate first arrives to attend the conference.

Functionally, the card and card-reader may cooperate in any one of a variety of ways, but in a practical arrangement to be described the card is read optically, as by an array of LEDs.

Preferably, one card-reader will be provided for every group of four or five delegates, the card-reader being self-contained and fully portable so that it can be passed from one delegate of the group to another when it is required for use. Transmission from such a card-reader may be by means of infra-red radiation, directed at a wall mounted receiver, the latter being linked to the chairman via the controlling computer. Delegate information read by the card-reader is preferably transmitted in pulse code. For example, a 14 bit reader may provide an output consisting of eleven bits of delegate code, a two bit steering code and a one bit parity check.

The card-reader desirably also serves as a talkback unit, incorporating a microphone into which a delegate can speak when authorised to do so, the speech also being transmitted to an adjacent wall receiver as an infra-red pulse code modulation. Authorisation to speak is conveniently given by an indicator on the card-reader, e.g. an LED indicator, operated via an infra-red receiver in said card reader and which receives an authorisation signal from the chairman via the controlling computer and an adjacent wall mounted transmitter.

The wall transmitters are also used to transmit a speech which is being delivered to the delegates, transmission again being in the form of an infra-red pulse code modulation. For receiving such speech, in a selected language, each delegate is provided with a portable receiver headset having selectable channels for choice of language.

A practical arrangement embodying the invention is now described by way of example with reference to the accompanying drawings, in which:-

Figure 1 is a semi-pictorial diagram of the system;

Figures 2 and *3* are diagrams for assisting understanding of the pulse code modulation system employed,

Figure 4 is a block diagram of the overall system;

Figure 5 is a block diagram of a receiver headset;

Figure 6 is a block diagram of a card-holder and talkback unit;

Figure 7 is a block diagram of a wall transmitter;

Figure 8 is a block diagram of a wall receiver; and

Figure 9 is a schematic circuit diagram of a computerised control unit.

Description of embodiment

Figure 1 shows schematically the various units of the conference communications system. All the units are linked via a main control 10 incorporating interface units and connected to a computer 11.

The chairman indicated at 12 has a VDU and a keyboard connected via the main control at least to the wall receivers 14 and wall transmitters 16. The chairman may also control other facilities such as the hall public announcement system 18, the video system 20 and external recording and broadcasting links 22.

The speaker indicated at 24 is connected via the microphone 26 and main control 10 at least with the facility 28 for simultaneous language interpretation, and thence the wall transmitters 16.

The delegates, one particular delegate being indicated at 30, can listen on a headset 32 having channels, e.g. for language selection, selectable by the user. Information is received at the headset by infra-red transmission from the wall transmitters 16. Each delegate also has access to a talkback unit 34, through which he can communicate, at least with the chairman, to indicate a wish to speak. Communication from the talkback unit to the wall receivers 14 is also by infra-red transmission. While the selected delegate is speaking, his photograph may be displayed on a back illuminated projection screen 35. The computer 11 may initially be fed with delegate information from a hotel computer 33.

Generally, therefore, the system is designed to provide two way communication between the speaker, chairman and delegates in a conference hall where delegates may wish to listen in a language different from that of the speaker. Basic features of such a simultaneous interpretation (SI) system are than the receiving channel is selectable by the delegate and that authorisation of talkback is under the complete control of the chairman, and under the supervision of a computer controlled conference management system.

Both the simultaneous interpretation receiver and the talkback unit are portable which is enabled by infra-red transmission.

It is unnecessary to provide portable talkback units at the rate of one per delegate; access to a unit is required only on talkback, and one per 4 or 5 delegates is normally sufficient. The units are identifiable on talkback so that one specific unit at a time can be switched on. In accordance with the invention, use of a delegate identification card inserted in the talkback unit when the delegate wishes to speak renders a non-specific talkback specific. This also enables the delegates to be identified automatically by the computer control. A chairman's and technician's visual display of a request-to-speak queue is provided.

The receiver unit is made in the form of compact, self contained headphones, and the talkback unit is hand held. This necessitates hybrid circuitry and dedicated gate arrays for miniaturisation.

There follows a brief technical specification of the component units of the system.

Receiver Units (32)

a) Compact, lightweight, self contained headset, weight 250g.
b) 12 channel selected by delegate.
c) Audio bandwidth 3.5 kHz.
d) Signal/Noise ratio 45-50 dB.
e) Operation from PP3 type battery; 15 hours rechargeable, 50 hours non-rechargeable.

Talkback Units (34)

a) Compact, self contained handset, weight 600g.
b) 2 channel talkback, compatible with SI part of system.
c) Audio bandwidth 7kHz.
d) Signal/Noise ratio 45-50 dB.
e) Capacity 2000 delegates, specific delegate (or maximum of two delegates) only authorised at one time, by a master control console.
f) Delegate requests to speak by insertion of an individual coded identification card in the talkback unit. Non-specific delegate talkback units, e.g. only a limited number of talkback units are provided and distributed so that they are accessible to delegates at the rate of 1 per 4 or 5 seats.
g) LED status indicator on unit -
Red - Card inserted and read, remove card,
Green - speak now,
Alternate Red-Green - 1 minute to speak,
Yellow - battery low.
h) Operation from 4 x C batteries; 15 hours talkback, rechargeable, 40 hours non-rechargeable.

Wall Mounted Transmitters (16)

a) Emitter Wavelength 950 nm
b) Radiated Power 1W
c) Angle of emission ±30
d) Range of SI Receiver on axis 10m
e) Size (excl mounting bracket) 250 × 70 × 65mm
f) Weight 1.3 kg
g) Power consumption 100 - 240 V AC 20 VA.

Wall Mounted Receivers (14)

a) Detector Wavelength 950 nm
b) Field of view ±60
c) Range of Talkback Unit on axis 10m
d) Size (excl mounting bracket) 250 × 70 × 65mm
e) Weight 900g
f) Power consumption 100-240 AC 10 VA

Computer Control System (10)

a) System controlled from master control console using computer and VDU, under control of the conference management system. Up to 2000 delegates.
b) Talkback queue system, up to 20 delegates requesting to speak with retention of data on previous 5 talkback speakers.
c) VDU display of data on delegate (or two delegates) speaking, on first 10 delegates requesting to speak, and on previous 5 speakers. Roll-around display of next 10 delegates requesting to speak if required.
d) Chairman VDU and simplified chairman controls.
e) Up to 20 characters of information stored and displayed per delegate; information initially read from conference computer for up to 2000 delegates and then stored independently.
f) In accordance with the present invention, delegate queue information is outputted to a video computer system for video display of the delegate's picture when he speaks.
g) System highly immune to corruption and unsuspected switch-on.

There now follows a technical description which will make clear the construction and manner of operation of the system.

Pulse Coding

Making reference to Figures 2 and 3, the infrared transmission is in the form of trains of nominal 1 microsec. pulses, forming a scar which is repeated after a period of approximately 100 microsec. The repeating of the scan at this rate samples the simultaneous (SI) signals at 10 kHz enabling an audio bandwidth of 3.5 kHz to be achieved.

A talkback bandwidth of 7 kHz is obtained by sampling twice per scan at approximately equal time intervals.

The scan also contains coded delegate pulses for identification and pulses for synchronisation.

SI and delegate code pulses are radiated from the wall transmitters and are detected by the headphone SI receivers and a receiver part of the talkback units. Talkback pulses are radiated from the talkback units and are detected by the wall receivers.

To prevent mutual interference the various trains of pulses which make up a single scan occur in different time frames within the scan which are not overlapping. Thus, a single scan consists of a frame of SI pulses, a frame of delegate code pulses and two frames of talkback pulses, as shown in Figure 2. To accommodate the two talkback frames the train of SI pulses is divided into two groups, the first of 4 channels and the second of 8 channels. In addition to these main time frames the scan is preceded by a nominal 3 microsec. long start pulse and there is also a short time frame for a single pulse to register a "request to speak" (see also Figure 3).

The SI pulses, in two groups, each consist of a start and stop pulse, the first pulse of each group constituting a reference pulse. Audio modulation is effected as a change in time between the start and stop pulse. The nominal SI pulse spacing is 4 microsec. and the maximum modulation, corresponding to maximum audio signal is ±2 microsec. Therefore the SI pulse spacing is varying between 2 and 6 microsec. As shown in Figure 2, the stop pulse of one channel is the reference pulse of the next channel and the SI frames are not fixed in time length but are equal to the sum of the instantaneous modulation levels of the individual channels. Hence, relative to the start pulse of a given scan, the stop pulse of an SI channel is modulated not only by its own channel, but by the modulation level of all the preceding SI channels.

The start pulse is triggered by the last SI pulse of the previous scan, so that the scan length is continuously variable. This is thus a considerable saving in average time per scan compared with the provision of a fixed frame time, which must exceed the time for maximum modulation. The time of a fixed frame would be over 72 microsec. (12 × 6 microsec.) while the average time is 48 microsec. (12 × 4 microsec.)

It follows from the variable frame time that the SI pulses can only be identified by a counting technique, and the demodulation of the SI channel n is achieved by counting to the nth and n+1th pulses and deriving a single pulse equal in length to the time between them. This effectively rejects the modulation of all other channels.

As the talkback bandwidth is 7 kHz there are two samples per scan, i.e. two talkback time frames, (Figure 2). These are each 21 microsec. long, the first immediately after the start pulse and second after SI channel 4. The talkback frames are of fixed length because there are two independent talkback channels, transmitted from independent talkback units.

Each talkback channel therefore has a separate reference pulse. Relative to the start pulse, the time of the second frame varies according to the modulation of SI channels 1-4, but the width of the frame and position of the two reference pulses within the frame are fixed.

The maximum modulation in ±3 microsec., 50% higher than that of the SI channels which, in the signal-to-noise ratio, offsets the increase in noise due to larger audio bandwidth.

The delegate identification code is transmitted in a 15 microsec. time frame from 28 to 43 microsec. in the scan (Figure 2). The delegate identification is performed by transmitting a running number during each delegate scan, which is incremented for successive delegate scans up to a maximum of 2047. The time for 2047 delegate scans is approximately 1 second.

In accordance with the invention, in the talkback unit the delegate codes are received and compared with the code of the inserted card. When there is correspondence, a request to speak pulse is sent back at the time of the next delegate scan. A request to speak is therefore identified against the requesting speaker by the time at which the request pulse is received during the delegate scans. This check is performed in the computer interface section of the master control box.

The delegate code also contains specific instructions controlling the talkback unit, which are identified by association with the particular delegate code. Delegate code, instructions and parity bits have 30 binary bits, or pulses per delegate number for coding. There are 6 binary bits per scan (Figure 2) so that a single delegate code scan occupies 5 complete SI talkback scans. The first scan is identified by a nominal 4 microsec. "start delegate code" pulse (Figure 3). The follow the 11 binary digits of the delegate number and the 7 binary digits of the instructions interspaced with 2 parity bits per SI scan (Figure 3).

These 5 scans take approximately 500 microsec. (5 x 100 microsec.) so that the total time to scan all 2000 delegate numbers is approximately 1 second. The request to speak pulse from the talkback unit is transmitted immediately preceding the "start delegate code" pulse of the next (higher) delegate code scan. Recognition of a delegate code by the talkback unit occurs after a single delegate scan, and implementation is continued while the instruction continues to be received.

Overall System

A block diagram of the overall system is shown in Figure 4, with the individual main system parts shown in their functional relationships to each other. The internal functional relationships of the main components are also shown.

The chairman's microphone 40 and speaker's microphone 42 are connected to a master audio mixer 44 whose output can be fed directly to the public address system 46, to the headphones of the simultaneous interpretation booths 48 and to a filter/limiter section 50 of the SI infra-red transmission system.

The SI outputs, in the various languages, are also fed to the mixer 44 where they are routed to the SI transmission system, and also, as required, to the public address (PA) system 46.

Demodulated audio signals from talkback can also be fed through the mixer 44 to the PA system 46 or to the SI booths 48 as required for interpretation. Audio outputs from the mixer 44 are available at the recording and outside broadcast booth 52 and also for recording on tape decks in the main control system.

Request to speak and talkback signals are picked up by the wall receivers 54 and routed to the demodulator 56 in the control room. Gating pulses are routed from a decoder/timer 55 to all the wall receivers 54 to ensure that receiver squelch circuits are operated only by the close-by talkback signals of sufficient amplitude in the appropriate channel, and not by SI pulses from nearby wall transmitters 56.

The main control of the system is by the technician and the computer keyboard and the computer VDU 58. The computer is interfaced to the SI system and also to the video and hotel computer systems respectively 60, 62. In accordance with the invention, the video interlink transmits delegate data to the video system to display the speaking delegate's video photograph. The hotel computer transmits the delegate data to the computer 50 at the beginning of a conference.

A duplicate VDU 64 displays the delegate request-to-speak queue directly to the conference chairman, who also has a simple keyboard interface 66 with the computer. This keyboard has 5 basic controls, "Next Delegate", "Previous Delegate", "1 Minute to Speak", "Stop" and "Speak". The chairman can therefore switch on the next delegate's talkback microphone, or he can skip individual delegates to any given point in the queue or return to delegates who have previously spoken.

There follows a more detailed description of the individual units of the system.

SI Receiver

The receiver comprises two hybrid parts, the front end 70 and the audio section 72 (Figure 5). The latter, in addition to the audio output stages, also contains the demodulator 74 and the universal timer gate array 76 which decodes the signal from the front end. A separate, small PCB 78 contains a 5V stabiliser since the circuit requires both 9V and 5V supplies.

a) *Front End 70*

Two PIN photodiode detectors 80 are encapsulated in plastics which is opaque in the visible spectrum, and transmits only the near infra-red. This ensures low sensitivity to visible light transients, and detector saturation only at light levels approaching direct sunlight. An acrylic lens increases the detector sensitivity by 2.5-3 times in the forward direction while maintaining the sensitivity at 60° from normal incidence at least equal to that of bare detectors.

The detector output is amplified by the preamplifier 82, the output of which is fed to a signal comparator 84 and a squelch comparator 86. The rectified output is also fed back to an FET which acts as a gain control resistor across the input. When the signal level exceeds the squelch level the squelch comparator outputs and closes an analogue switch. This connects the demodulated audio signal to the audio stages. The signal comparator produces from the analogue signal a corresponding train of pulses of constant amplitude and of almost constant width. This output passes directly to the universal timer gate array 76 on the audio hybrid.

b) *Audio Hybrid 72*

The audio hybrid consists of the universal timer gate array 76, the demodulator 74, a low pass filter 88 and an audio amplifier 90. Functionally, the timer gate array 76 decodes the SI pulse train giving a single output pulse whose width is equal to the spacing of the two SI pulses defining the required channel.

SI input pulses are passed to a 4 bit binary counter and to a start pulse detector. When the latter recognises the 3 microsec. start pulse it initiates a 43 microsec. count from the master clock. After 43 microsec. the 4 bit counter is "enabled" and gates the SI pulses to a presettable down counter, set by the channel select switch to output after the count corresponding to the selected channel. The function of the adder is to discount the extra pulse between SI channels 4 and 5. When the count reaches that of the set channel number the system is reset.

If the presettable counter is preset to a channel count exceeding 4, a count of 4 pulses is outputted before the reset pulse and the 4 bit counter is disabled and the SI pulse gate closed for a further 21 microsec., the time of the second talkback frame. After 21 microsec. the counters restart and count SI channels 5-12 pulses. At the channel pulse count the presettable counter carries to the next SI pulse, which is therefore the required "width" pulse in proportion to the modulation.

The width pulse activates an analogue switch controlling a constant current capacitor charge and the charge on this capacitor is sampled and held as the demodulated audio signal. After passing through the squelch gate and volume control the 10 kHz and other high frequency components are blocked by the low pass filter and the audio output is buffered to the earpieces.

Talkback Unit

Functionally the talkback unit (Figure 6) can be divided into six main components; an optical card reader 92, a card reader gate array 94 (which handles the delegate data and instructions), a universal timer gate array 96 (which decodes the synchronising signals, provides timing signals and enclodes the modulated talkback signal), a receiver front end 98, an infra-red transmitter 100, and finally, a microphone and associated audio section 102.

a) *Card Reader 92*

The card reader initially senses the inserted delegate card and activates the array of reader LEDs and detectors which are pulse operated to conserve power. The 14 bit reader output consists of 11 bits of delegate code, a 2 bit steering code and a one bit parity check. The steering code enables the delegate card to be inserted either way round.

b) *Receiver 98*

The receiver is a front end hybrid identical to that of the SI receiver, which outputs delegate and SI data and a squelch signal.

c) *Card Reader Gate Array 94*

The card reader output is parity and steering checked (at 91) on the gate array (Figure 6) and the sorted delegate code is fed to a comparator 93.

The delegate and SI signals are fed into a shift register 95 clocked and gated from the timer array so that the delegate pulses are separated from the other SI pulses and only they enter the shift register. The delegate code and the instructions are separated in the register, the delegate code is fed to the comparator and compared with the card reader code. When the two match an enable pulse gates the instruction data from the shift register to the 6 function controls 97. The function controls are initiated immediately the enable is activated but are only maintained in the on condition if the function is confirmed at 1 second intervals by successive delegate scans.

The card reader and display LEDs are under the control of local clocks which determine their flashing rates. The reader clock also controls a delay in normal reset to reduce the chance of accidental reset while speaking. Under the control of the timing system, the delegate data is parity checked and in the event of a parity error, the cycle timing and hence the delegate code comparison is inhibited.

d) *Universal Timer Gate Array 96*

Using the data input from the receiver, the timer identifies both the 3 microsec. main scan reference pulse and the 4 microsec. delegate code reference. Time windows are decoded for both channels, for the delegate code period, and for the request to speak. The audio modulated talkback pulse is fed in from the audio stages 102 and the appropriate talkback and request to speak pulses are generated and fed to the transmitter 100.

e) *Transmitter 100*

The transmitter array uses 12 infra-red LEDs mounted behind an infra-red transparent housing which forms part of the talkback unit case.

f) *Audio Stages 102*

The microphone output is amplified under the control of the gain-select signal from the card reader. High frequency components are filtered out by a low pass filter 99 and the audio signal fed to the modulator 101. The modulator consists of a repetitive voltage ramp of constant rate, under the control of the timer and whose output is fed to a comparator along with the audio signal. The comparator output thus defines a time relative to the initiation of the ramp proportional to the audio modulation level, and this time is fed as a width pulse to the timer gate array for encoding.

Wall Transmitter

The wall transmitter 100 consists of an array of 30 infra-red LEDs which are switched by a single MOS FET power transistor (see also Figure 7).

Wall Receiver

The wall receiver 98 in basic form is similar to the hybrid front end, with the addition of an array of 10 detector/lens assemblies. However, several changes are made which affect the detailed operation of the unit.

To avoid the difficulties of paralleling the outputs of 50 or more receivers each receiver can input the outputs of two other receivers and OR gate then with its own output (see also Figure 8). In this way the outputs of a number of receivers appear as a single output of the last receiver in the chain, irrespective of which receiver or receivers actually picks up the talkback signal.

A given receiver can receive infra-red signals from two talkback units switched on separate channels and from wall transmitters in the vicinity, any of which might activate the squelch circuits. It is essential that when infra-red talkback pulses are being received near the limits of range from a talkback unit, these signals are not those from closer SI transmitters or a closer talkback unit on the adjacent channel, should activate the squelch.

The signal comparator passes all received signals (Figure 8). The master control system sends a short pulse train of 3 pulses preceded by a 2 microsec. identification pulse by cable to all wall receivers. These pulses are decoded in the wall receiver to give two gating pulses corresponding in time to talkback channels 1 and 2. These operate two analogue switches which route the analogue talkback pulses from the pre-amplifier to separate squelch comparators. The squelch comparator outputs are used to separately gate the main comparator output from which it follows that the receiver will respond independently to signals in either talkback channel, ignoring large adjacent channel talkback signals or SI signals.

Control Box, Computer and Delegate Display

The control box shown in Figure 9 interfaces directly with the wall transmitters, wall receivers and the computer. It also takes in the 12 SI audio channel signals and multiplexes them, and decodes and demodulates the talkback pulses. The delegate codes are also generated here.

a) *SI Modulator and Talkback Demodulator Control Board (107)*

This board 107, like the SI receiver and talkback units, contains a universal timer gate array which generates timing and gating codes for all the other functions in the control box.

Timing signals are used by the gating code generator 106 to generate recognition pulses and coded squelch gate pulses for the wall receivers. The use of coded pulses enables two gate pulses to be sent down a single coaxial cable. This code generator also controls a talkback demodulator 105 which demodulates and separates talkback channels A & B.

The 12 SI audio inputs are passed through low pass filters 109 and are them multiplexed and during a single SI scan, each channel sample in turn produces modulation pulses in the same way as in the talkback unit. The SI and delegate code pulses interface with the wall transmitters through a driver 111.

b) *Delegate Code Generator and Computer Interface Board (113)*

Sequential delegate code pulses are generated under the control of timing pulses and fed both to the computer interface 108 and to the previous board 107. In the latter they are gated alongside the SI pulses to the wall transmitters.

The request to speak pulse is gated from the wall receiver signals in the computer interface and related to the simultaneous delegate code count in order to feed the codes of delegates "requesting to speak" to the computer.

Instructions from the computer also come through the interface and are set and coded in the delegate code generator 110 in the appropriate time slots after the delegate code. The interface also connects the SI computer with the video system and the hotel computer.

c) *Computer and Delegate Display*

Delegate data is initially fed to the computer by the hotel computer system and is stored by the computer for the duration of the conference. The computer is thereafter independent of the hotel computer.

In accordance with the invention, the computer also sends delegate information and display instruction to the video system to abstract and display delegate video photographs.

Non-automatic instructions are typed into the computer by the technician or else introduced by the chairman's simplified keyboard.

Delegate information in the request to speak queue is displayed on both the computer's and chairman's VDUs.

Various modifications of the above described arrangement are possible within the scope of the invention as hereinbefore defined.

CLAIMS

1. A conference communications system including a delegate-accessible card reader and, for each delegate, a delegate identification card to which can be applied delegate identification data, the card reader being capable of receiving the card, reading the data thereon and transmitting the data to a remote location.

2. A system as claimed in Claim 1, wherein the card is read optically by the card reader.

3. A system as claimed in Claim 2, wherein the card is read by an array of LED's.

4. A system as claimed in any preceding claim wherein the card reader is self contained and fully portable so that it can be passed from one delegate to another when it is required for use.

5. A system as claimed in any preceding claim, wherein the card reader is adapted to transmit data by means of infra-red radiation to a wall mounted receiver.

6. A system as claimed in any preceding claim, wherein delegate information read by the card reader is transmitted in pulse code.

7. A system as **claimed in Claim 6**, wherein a 14 bit reader provides an output consisting of eleven bits of delegate code, a two bit steering code and a one bit parity check.

8. A system as claimed in any preceding claim, wherein the card reader also serves as a talkback unit, incorporating a microphone into which a delegate can speak when authorised to do so, the speech also being transmitted to an adjacent wall receiver as an infra-red pulse code modulation.

9. A system as claimed in Claim 8, wherein authorisation to speak is given by an indicator on the card reader, operated via an infra-red receiver in said card reader and which receives an authorisation signal from a remote location.

10. A system as claimed in any preceding claim, including a computer unit, a chairmans terminal, and wall mounted transmitter/receiver units, all remote from the delegate accessible card reader and wherein information can be passed from the card reader via the transmitter/receiver units to the computer unit, and from the computer unit to the chairman's **terminal.**

11. A system as claimed in Claim 10, wherein the wall transmitter/receiver units are used to transmit a speech which is being delivered to the delegates, transmission being in the form of an infra-red pulse code modulation, and for receiving the speech, each delegate is provided with a portable receiver headset having selectable channels for choice of language.

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